

Nemko Test Report: 1L0715RUS1

Applicant: Raze Technologies
2450 East Plano Parkway
Suite 188
Plano, Texas 75074

**Equipment Under Test:
(E.U.T.)** SkyFire™ Subscriber S-IAD

In Accordance With: **FCC Part 15, Subpart E**
Unlicensed National Information Infrastructure(UNII)
Devices

Tested By: Nemko Dallas Inc.
802 North Kealy
Lewisville, Texas 75057

Authorized By:



Tom Tidwell, Wireless Group Manager

Date: 5/15/02

Total Number of Pages: 30

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EQUIPMENT: SkyFire™ Subscriber S-IAD**Section 1. Summary Of Test Results**

Manufacturer: Raze Technologies

Model No.: SkyFire™ Subscriber S-IAD

Serial No.: None

General: **All measurements are traceable to national standards.**

These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with FCC Part 15, Subpart C for low power devices. All tests were conducted using measurement procedure ANSI C63.4-1992. Radiated Emissions were made on an open area test site.



New Submission



Production Unit



Class II Permissive Change



Pre-Production Unit

THIS TEST REPORT RELATES ONLY TO THE ITEM(S) TESTED.

THE FOLLOWING DEVIATIONS FROM, ADDITIONS TO, OR EXCLUSIONS FROM THE TEST
SPECIFICATIONS HAVE BEEN MADE.
See “ Summary of Test Data”.

**NVLAP LAB CODE: 100351-0**

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This report applies only to the items tested.

EQUIPMENT: SkyFire™ Subscriber S-IAD**Summary Of Test Data**

NAME OF TEST	PARA. NO.	SPEC.	RESULT
Emission Bandwidth	15.403(c)	-26 dBc	Complies
Peak Transmit Power	15.407(a)(3)	Lesser of 1 Watt or 17 dBm + 10logB	Complies
Peak Power Spectral Density	15.407(a)(3)	17 dBm	Complies
Ratio of the peak excursion of the modulation to the peak transmit power	15.407(a)(6)	13 dB	Complies
Spurious Emissions below 1 GHz	15.407(b)(5)	15.209	Complies
Spurious Emissions above 1 GHz	15.407(b)(3)	-17 dBm/MHZ > 10 MHz from bandedge -27 dBm/MHZ < 10 MHz from bandedge	Complies

Footnotes:

EQUIPMENT: SkyFire™ Subscriber S-IAD

Section 2. General Equipment Specification

Frequency Range: 5.725-5.825 GHz

Operating Frequency(ies) of Sample: 5.729 to 5.821 GHz

Modulation: Digital

Integral Antenna

Yes

☐

No

☒

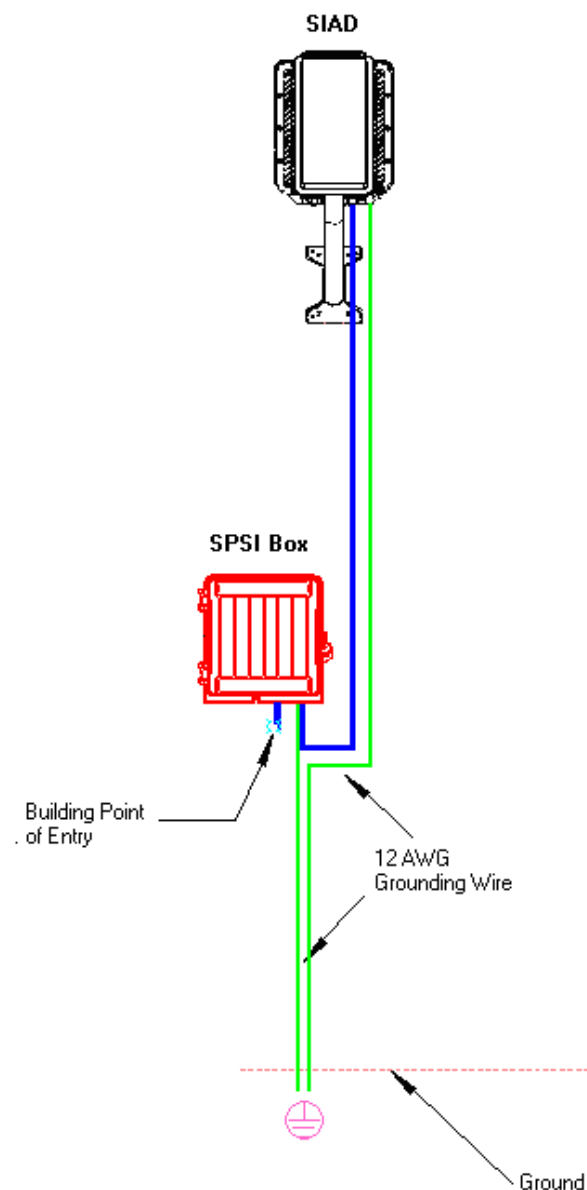
Note: This device is preassembled at the factory and professionally installed The manufacturer maintains control of the installation..

EQUIPMENT: SkyFire™ Subscriber S-IAD

Theory of Operation

The RF portion of the unit is developed to transmit (TX) and receive (RX) wireless data from baseband to RF and RF to baseband using Time Division Duplexing (TDD). The duty cycle is 30% transmit and 70% receive when active. When there is no data to transmit the DC voltage to the transmit section is turned off and the receiver is turned on and listening to the basestation. The 26dB BW of the signal is 5.85MHz (channel BW). The RF frequency range that is used is 5726MHz – 5824MHz and since our channel BW is 5.85MHz and the RF step size is 1MHz the RF LO goes from 5249MHz – 5341MHz. The first IF is at 480MHz and the second IF is at 24MHz.

System Diagram



EQUIPMENT: SkyFire™ Subscriber S-IAD**Section 3 Emission Bandwidth**

NAME OF TEST: Emission Bandwidth	PARA. NO.: 15.403(c)
TESTED BY: David Light	DATE: 4/18/2002

Minimum Standard: 15.403(c) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier..

Test Results: Complies

Measurement Data: See attached plots

EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Emission Bandwidth



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Data Plot

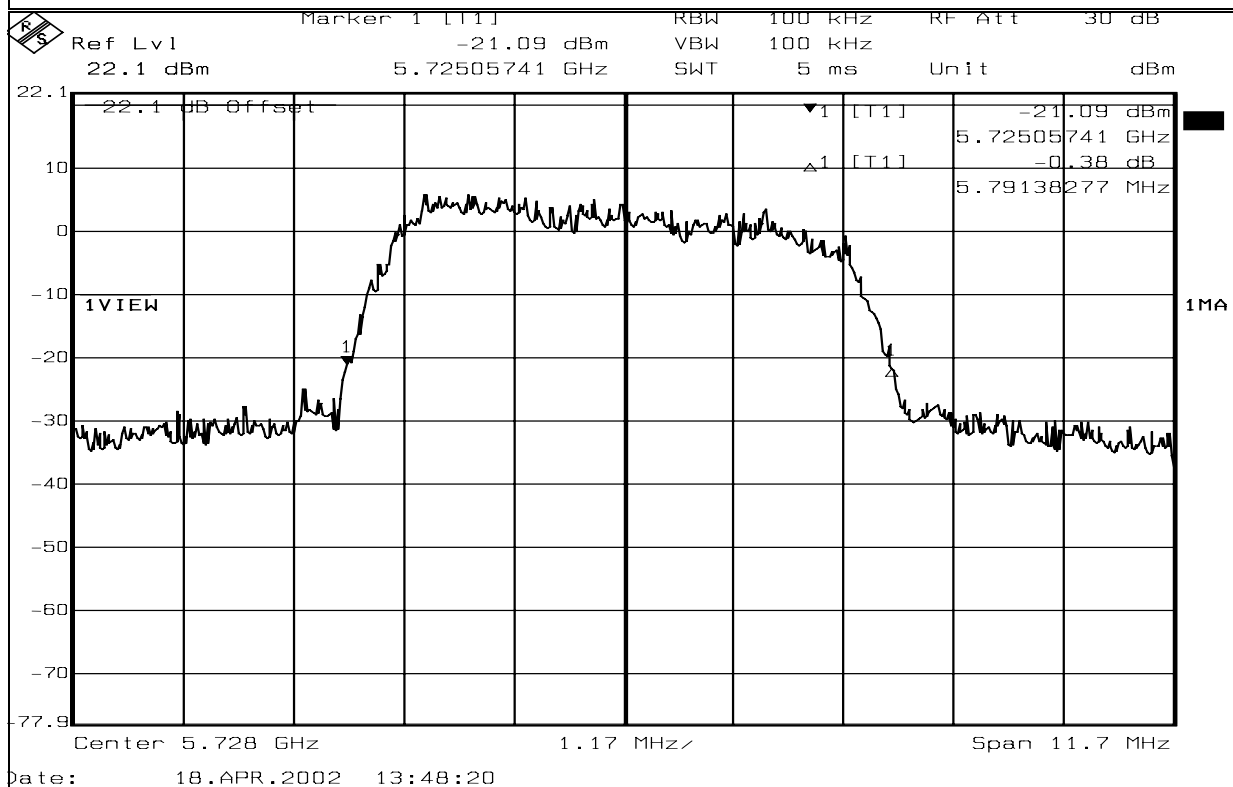
Page 1 of 2

Job No.: 1L0715R Date: 4/18/2002
Specification: Part 15 Subpart E Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: UNII TRANSMITTER
Configuration: TX
Sample Number: 1
Location: Lab 1 RBW: 100 kHz
Detector Type: Peak VBW: 100 kHz

Complete X
Preliminary: _____

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1483
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1478 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Notes: LOWEST OPERATING CHANNEL

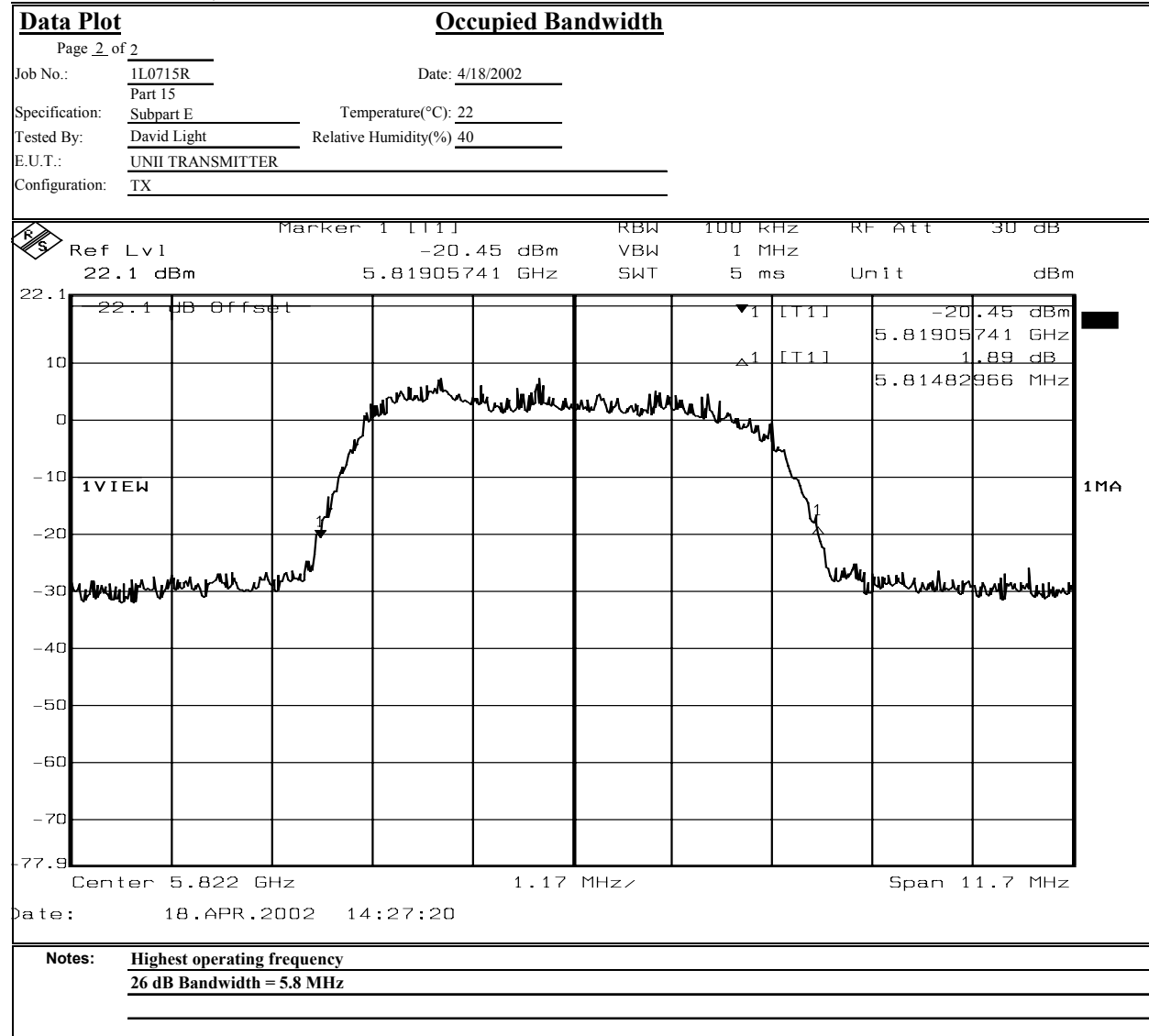
EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Emission Bandwidth



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EQUIPMENT: SkyFire™ Subscriber S-IAD**Section 4. Peak Transmit Power**

NAME OF TEST: Peak Transmit Power	PARA. NO.: 15.407(a)(3)
TESTED BY: David Light	DATE: 4/18/2002

Minimum Standard: 15.407(a)(3) For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10logB, where B is the 26-dB emission bandwidth in MHz.

Test Results: Complies

Measurement Data:

Frequency (GHz)	Power Output at Antenna Terminal (dBm)	Antenna Gain (dBi)	Power Output (EIRP)
5.729	11.3	18	29.3
5.821	11.3	18	29.3

Measurement Uncertainty: +/- 0.6 dB

Test Conditions:

Temperature: 22° C
Relative Humidity: 40%

Test Equipment used: 406-1056

EQUIPMENT: SkyFireTM Subscriber S-IAD

Section 5. Peak Spectral Density

NAME OF TEST: Peak Spectral Density	PARA. NO.: 15.407(a)3)
TESTED BY: David Light	DATE: 4/18/2002

Minimum Standard: 15.407(a)(3) The peak power spectral density shall not exceed 17 dBm in any 1-MHz band.

Test Results: Complies.

Measurement Data: See attached graph(s).

Method of Measurement: Refer to annex

EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Peak Spectral Density



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Data Plot

Peak Power Spectral Density

Page 1 of 2

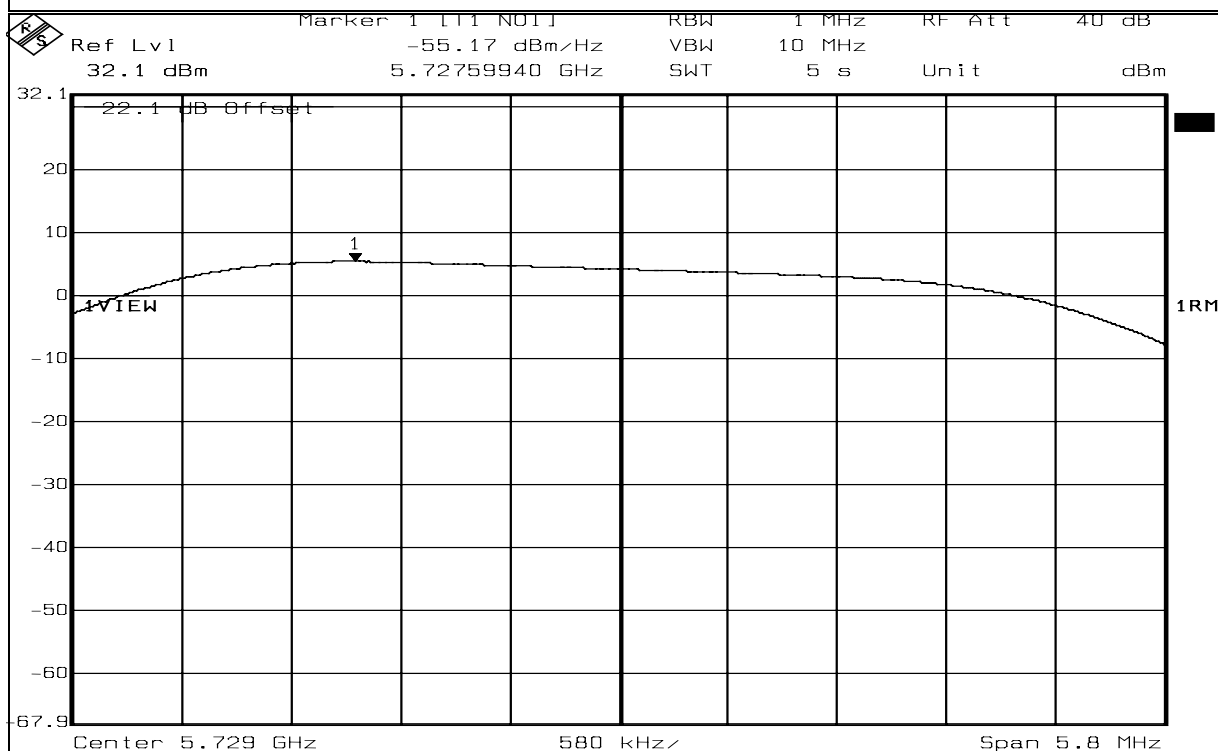
Complete X

Job No.: 1L0715R Date: 4/18/2002
Specification: Part 15 Subpart E Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: UNII TRANSMITTER
Configuration: TX
Sample Number: 1
Location: Lab 1 RBW: 1 MHz
Detector Type: Sample VBW: 1 MHz

Preliminary: _____

Test Equipment Used

Antenna: _____ Directional Coupler: _____
Pre-Amp: _____ Cable #1: 1483
Filter: _____ Cable #2: _____
Receiver: 1036 Cable #3: _____
Attenuator #1: 1478 Cable #4: _____
Attenuator #2: _____ Mixer: _____
Additional equipment used: _____
Measurement Uncertainty: +/-1.7 dB



Date: 22.APR.2002 17:38:59

Notes: LOWEST OPERATING CHANNEL

-55.17 dBm/Hz = 4.83 dBm/MHz

EQUIPMENT: SkyFire™ Subscriber S-IAD

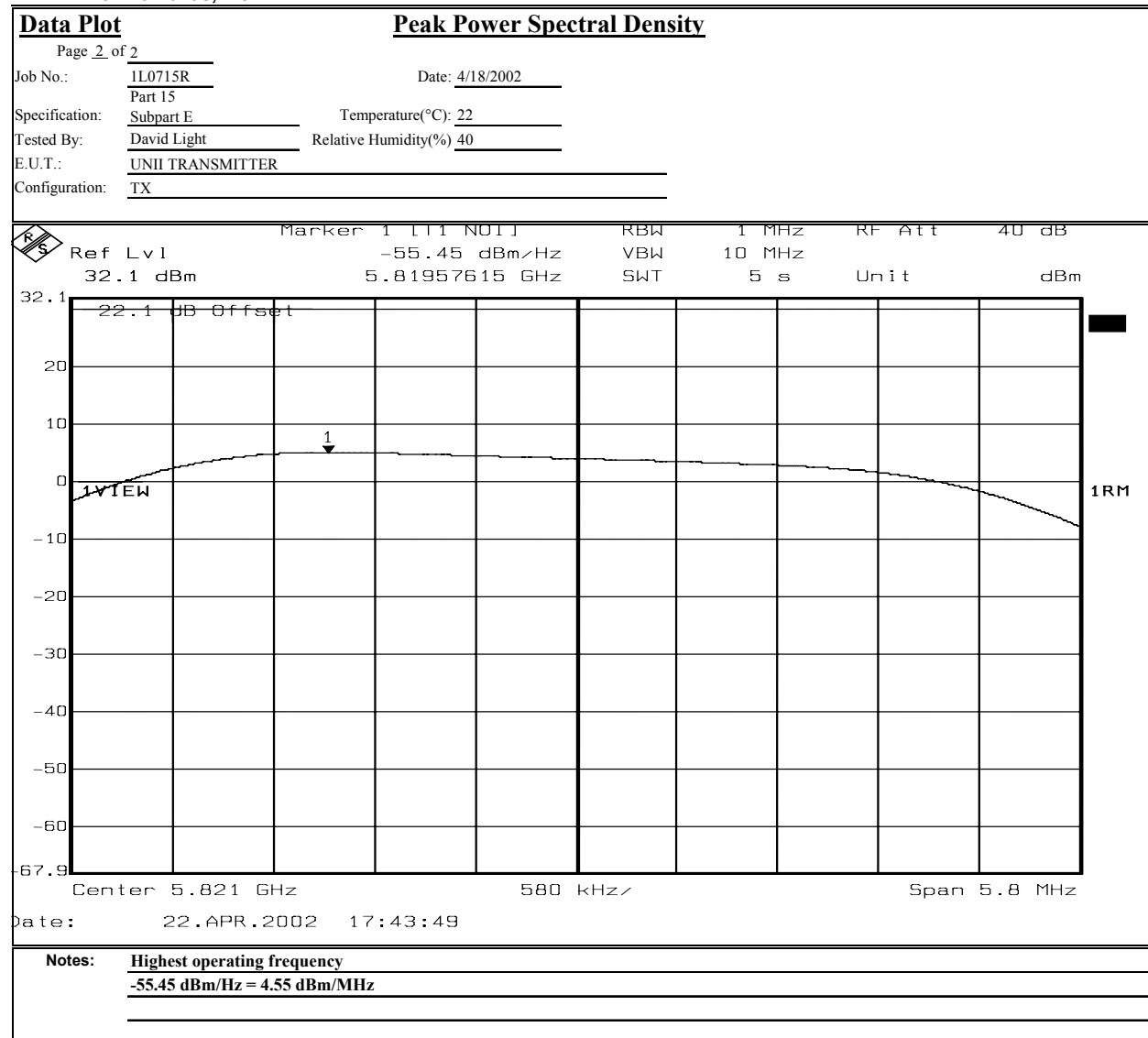
Test Data – Peak Spectral Density



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EQUIPMENT: SkyFire™ Subscriber S-IAD

Section 6. Peak to Average Ratio

NAME OF TEST: Peak to Average Ratio	PARA. NO.: 15.407(a)6)
TESTED BY: David Light	DATE: 4/18/2002

Minimum Standard 15.407(a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified in this paragraph) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

Test Results: Complies.

Measurement Data: See attached graph(s).

Method of Measurement: Refer to annex

EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Peak to Average Ratio



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Data Plot

Page 1 of 2

Peak to Average Ratio

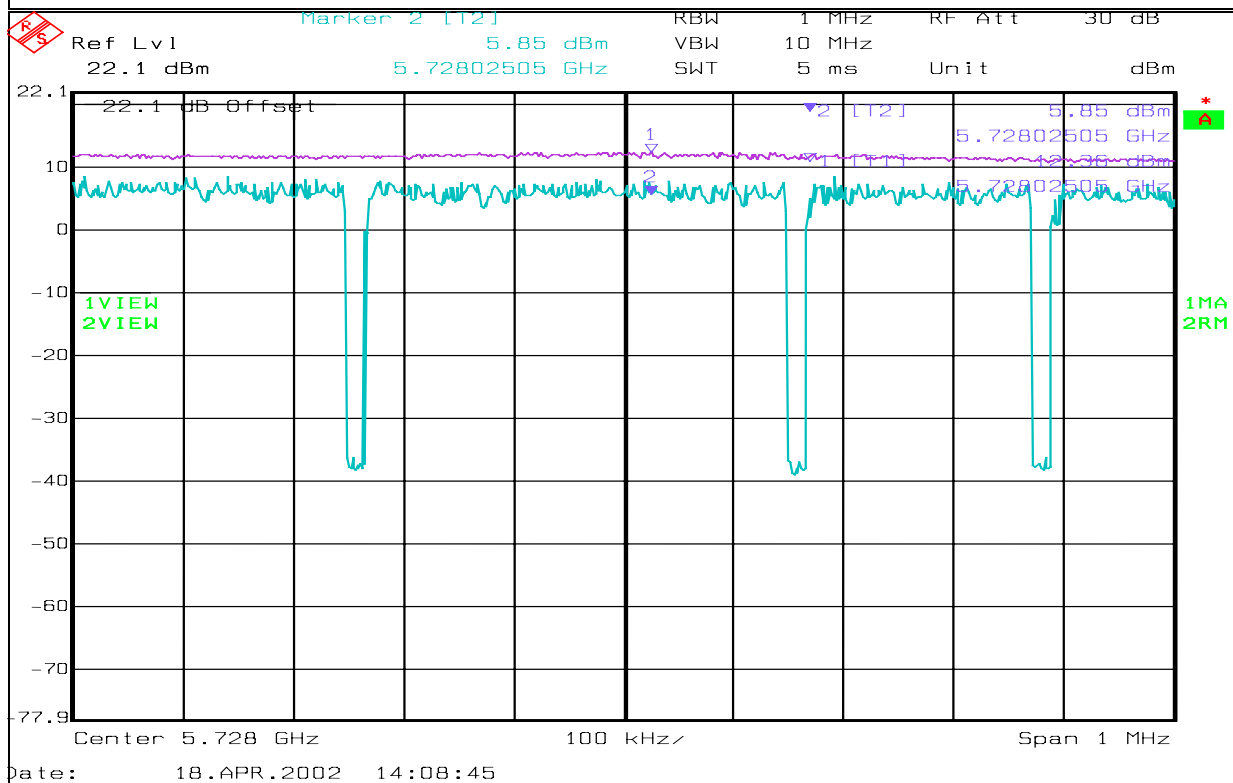
Complete X

Preliminary: _____

Job No.:	1L0715R	Date:	4/18/2002
Specification:	Part 15 Subpart E	Temperature(°C):	22
Tested By:	David Light	Relative Humidity(%)	40
E.U.T.:	UNII TRANSMITTER		
Configuration:	TX		
Sample Number:	1		
Location:	Lab 1	RBW:	1 MHz
Detector Type:	Peak	VBW:	Refer to plots

Test Equipment Used

Antenna:		Directional Coupler:	
Pre-Amp:		Cable #1:	1483
Filter:		Cable #2:	
Receiver:	1036	Cable #3:	
Attenuator #1	1478	Cable #4:	
Attenuator #2:		Mixer:	
Additional equipment used:			
Measurement Uncertainty:	+/-1.7 dB		



Notes: LOWEST OPERATING CHANNEL
6.5 dB Peak to Average ratio

EQUIPMENT: SkyFire™ Subscriber S-IAD

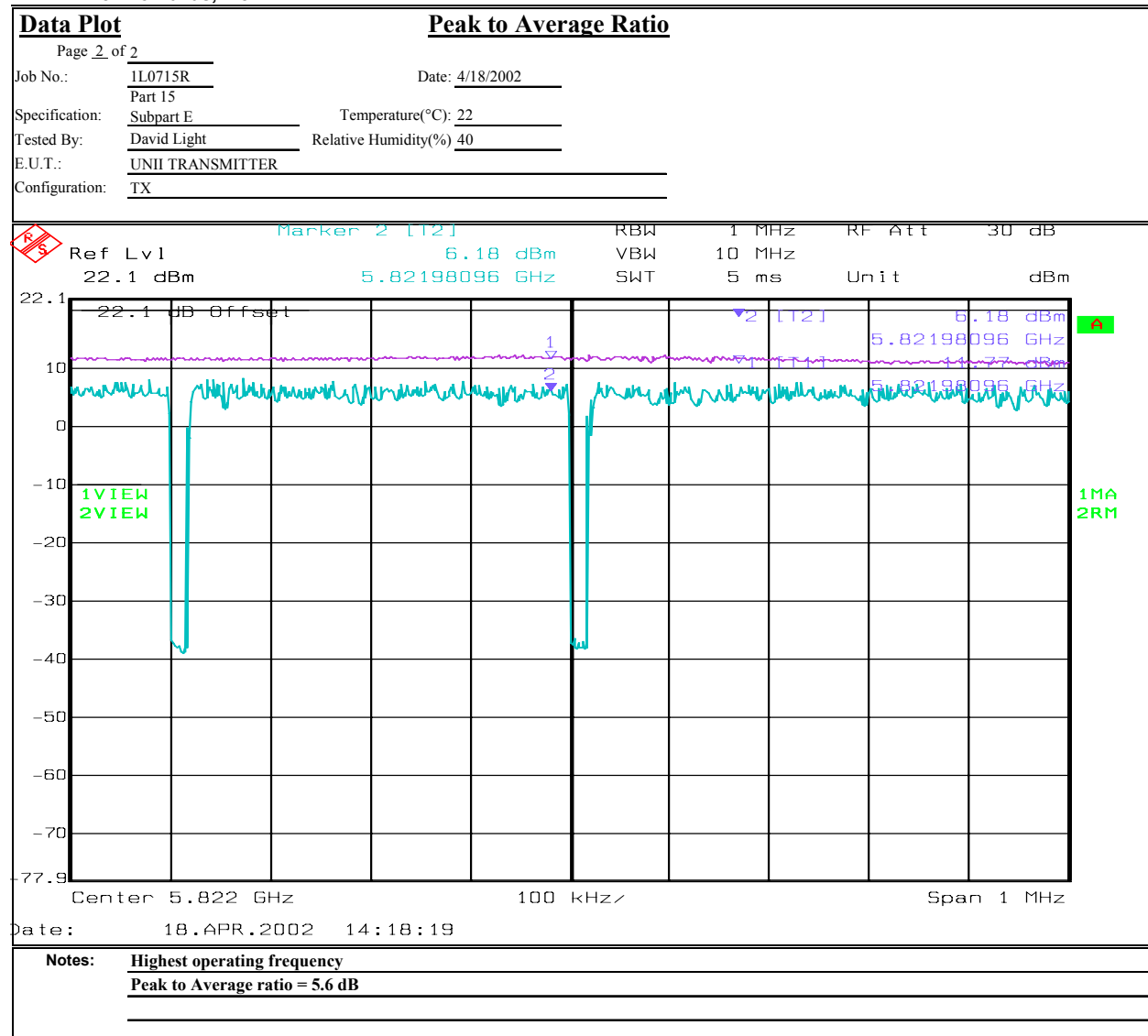
Test Data – Peak to Average Ratio



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EQUIPMENT: SkyFire™ Subscriber S-IAD**Section 7 Spurious Emissions Below 1 GHz**

NAME OF TEST: Spurious Emissions Below 1 GHz	PARA. NO.: 15.407(b)5)
TESTED BY: Shannan Nealy	DATE: 2/19/2002

Minimum Standard 15.407(b)(5) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

Frequency(MHz)	Field Strength (dBμV/m @ 3m)
30 - 88	40.0
88 - 216	43.5
216 - 960	46.0
Above 960	54.0

Test Results: Complies.

Measurement Data: See attached graph(s).

Method of Measurement: Refer to annex

EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Spurious Emissions Below 1 GHz



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Radiated Emissions Data

Complete X
Preliminary Job # : 1L0715E Test # : REHE-02
Page 1 of 2

Client Name : Raze Technology

EUT Name : Sky Fire Subscriber Unit

EUT Config : Typical

Specification : CFR47 Part 15, Subpart B, Class B

Reference : Section

Rod. Ant. # : NA Temp. (deg. C) : 23

Date : 2/19/02

Bicon Ant.# : 499 Humidity (%) : 38

Time : 1:00pm

Log Ant.# : 1034 EUT Voltage : 115Vac

Staff : Shannan WT Nealy

Bilog Ant.# : NA EUT Frequency : 60Hz

Photo ID: 1L0715E REHE-02

Dipole Ant.# : NA Phase: Single

Peak Bandwidth: 100kHz

Cable# : 1514 Location: B OATS

Video Bandwidth 100kHz

Preamp# : 1554 Distance: 3m

Limiter# : 1605

Atten # : NA

Detector# : 785

Meas. Freq. (MHz)	Ant. Pol. (H/V)	Det. Atten. (dB)	Meter Reading (dBuV)	Antenna Factor (dB)	Path Loss (dB)	RF Gain (dB)	Corrected Reading (dBuV/m)	Spec. limit (dBuV/m)	CR/SL Diff. (dB)	Pass Fail Unc.	Comment
50	V	0	39	11.8	1.9	24.2	28.5	40.0	-11.5	Pass	
75	V	0	37	9.2	2.3	24.4	24.1	40.0	-15.9	Pass	
90	V	0		9.6	2.3	24.4	-12.5	43.5	-56.0	Pass	Couldn't see-- In Noise
100	V	0	46.1	9.9	2.7	24.2	34.5	43.5	-9.0	Pass	Noise Floor Reading
125	V	0	30	11.4	2.9	24.4	19.9	43.5	-23.6	Pass	Noise Floor Reading
131.1	V	0	30.9	11.4	2.9	24.4	20.8	43.5	-22.7	Pass	
150	V	0	36.1	12.6	2.9	24.4	27.2	43.5	-16.3	Pass	
163.85	V	0	33.7	12.7	2.9	24.4	24.9	43.5	-18.6	Pass	
175	V	0	27.8	13.7	2.9	24.2	20.2	43.5	-23.3	Pass	Noise Floor Reading
180	V	0	37	14.1	2.9	24.2	29.8	43.5	-13.7	Pass	
200	V	0	47.2	14.8	3.8	24.3	41.5	43.5	-2.0	Pass	Refer to QP
200	V	0	43.5	14.8	3.8	24.3	37.8	43.5	-5.7	Pass	QP #1544
270	V	0	33.3	15.9	4.3	24.3	29.2	46.0	-16.8	Pass	
300	V	0	37.6	18.2	4.8	24.4	36.2	46.0	-9.8	Pass	
50	H	0	33	11.8	1.9	24.2	22.5	40.0	-17.5	Pass	
75	H	0	37.3	9.2	2.3	24.4	24.4	40.0	-15.6	Pass	
90	H	0		9.6	2.3	24.4	-12.5	43.5	-56.0	Pass	Couldn't see-- In Noise
100	H	0	48.8	9.9	2.7	24.2	37.2	43.5	-6.3	Pass	Couldn't see-- In Noise
125	H	0	32	11.4	2.9	24.4	21.9	43.5	-21.6	Pass	
131.1	H	0	31.3	11.4	2.9	24.4	21.2	43.5	-22.3	Pass	
150	H	0	41	12.6	2.9	24.4	32.1	43.5	-11.4	Pass	

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EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data – Spurious Emissions Below 1 GHz



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Radiated Emissions Data

Complete	<u>X</u>
Preliminary	

Job #: 1L0715E Test #: REHE-02
Page 2 of 2

Client Name : Raze Technology

EUT Name : Sky Fire Subscriber Unit

EUT Config. : Typical

Specification : CFR47 Part 15, Subpart B, Class B

Reference :	Section
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EQUIPMENT: SkyFire™ Subscriber S-IAD

Photos – Spurious Emissions Below 1 GHz

Front



Rear



EQUIPMENT: SkyFire™ Subscriber S-IAD

Section 8 Spurious Emissions Above 1 GHz

NAME OF TEST: Spurious Emissions Above 1 GHz	PARA. NO.: 15.407(b)(3)
TESTED BY: David Light	DATE: 4/22/2002

Minimum Standard 15.407(b)(3) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz

Test Results: Complies.

Measurement Data: See attached graph(s).

Method of Measurement: Refer to annex

EQUIPMENT: SkyFire™ Subscriber S-IAD

Test Data –Spurious Emissions Above 1 GHz



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EIRP Substitution Method

Page 1 of 1

Job No.: 1L0715R Date: 4/22/2002 Complete X
Preliminary _____

Specification: Part 15, Subpart E Temperature(°C): 22
Tested By: David Light Relative Humidity(%) 40
E.U.T.: UNII Device

Configuration: Tx Full Power, TDD Mode
Sample No: 1

Location: AC 3 RBW: 1 MHz Measurement
Detector Type: Average VBW: 10 Hz Distance: 3 m

Test Equipment Used

Antenna: 1304 Directional Coupler: _____
Pre-Amp: 1016 Cable #1: 1484
Filter: 1651 Cable #2: 1485
Receiver: Cable #3: 1046
Attenuator #1: Cable #4: _____
Attenuator #2: Mixer: _____

Additional equipment used: 1650 983 991 988 989 984 1651 992
Measurement Uncertainty: +/-3.6 dB

Frequency (MHz)	Meter Reading (dBm)	Correction Factor (dB)		Pre-Amp Gain (dB)	Substitution Antenna Gain (dBi)	Limit (dBm/MHz)	EIRP (dBm/MHz)	EIRP (mW)	Polarity	Comments
										Vertical antenna
										Lowest channel
5725	-71.3	39.8		0	11.4	-17	-20.1	0.0098	V	5729 MHz Center
5725	-76.2	37.8		0	11.4	-17	-27.0	0.0020	H	
11458	-69.0	47.0		35.8	12.5	-27	-45.3	0.0000	H	Noise Floor
11458	-69.0	43.7		35.8	12.5	-27	-48.6	0.0000	V	Noise Floor
17187	-72.2	47.3		33	13.0	-27	-44.9	0.0000	V	Noise Floor
17187	-72.3	52.3		33	13.0	-27	-40.0	0.0001	H	Noise Floor
										Highest channel
5825	-76.5	37.8		0	11.4	-17	-27.3	0.0019	H	5821 MHz Center
5825	-72.2	39.8		0	11.4	-17	-21.0	0.0080	V	
11462	-71.2	47.0		35.8	12.5	-27	-47.5	0.0000	H	Noise Floor
11462	-71.2	43.7		35.8	12.5	-27	-50.8	0.0000	V	Noise Floor
17463	-71.7	47.3		33.5	13.0	-27	-44.9	0.0000	V	Noise Floor
17463	-71.7	52.3		33.5	13.0	-27	-39.9	0.0001	H	Noise Floor
										Horizontal antenna
5825	-72.0	37.8		0	11.4	-17	-22.8	0.0053	H	5821 MHz Center
5825	-76.0	39.8		0	11.4	-17	-24.8	0.0033	V	
11462	-70.8	43.7		35.8	12.5	-27	-50.4	0.0000	V	Noise Floor
11462	-70.8	47.0		35.8	12.5	-27	-47.1	0.0000	H	Noise Floor
17463	-71.5	52.3		33.5	13.0	-27	-39.7	0.0001	H	Noise Floor
17463	-71.5	47.3		33.5	13.0	-27	-44.7	0.0000	V	Noise Floor
										5729 MHz Center
5725	-75.2	39.8		0	11.4	-17	-24.0	0.0040	V	
5725	-71.3	37.8		0	11.4	-17	-22.1	0.0062	H	
11458	-69.0	47.0		35.8	12.5	-27	-45.3	0.0000	H	Noise Floor
11458	-69.0	43.7		35.8	12.5	-27	-48.6	0.0000	V	Noise Floor
17187	-72.2	47.3		33	13.0	-27	-44.9	0.0000	V	Noise Floor
17187	-72.3	52.3		33	13.0	-27	-40.0	0.0001	H	Noise Floor

EQUIPMENT: SkyFire™ Subscriber S-IAD

Photos – Spurious Emissions Above 1 GHz

Front



Rear



EQUIPMENT: SkyFireTM Subscriber S-IAD**Section 9 Powerline Conducted Emissions**

NAME OF TEST: Spurious Emissions Above 1 GHz	PARA. NO.: 15.407(b)(5)
TESTED BY: Tom Tidwell	DATE: 2/22/02

Minimum Standard 15.407(b)(5) Any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207

Frequency	Maximum Powerline Conducted RF Voltage	
(MHz)	μV	dBμV
0.45 - 30.0	250	48

Test Results: Complies.

Measurement Data: See attached graph(s).

Method of Measurement: Refer to annex

PROJECT NO.1L0715RUS1

Nemko

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Complete Preliminary	<u>X</u>	Job # : 1L0715E	Test # : CEPV-01
		Page <u>1</u>	of <u>1</u>
Client Name :	<u>Raze Technology</u>		
EUT Name :	<u>SkyFire Subscriber Unit</u>		
EUT Config. :	<u>Typical</u>		
Specification :	<u>CFR47 Part 15, Subpart B, Class B</u>		
Transducer # :		Reference :	
HP Filter # :		Date :	<u>2/22/02</u>
Cable 1 # :	<u>1019</u>	Time :	<u>14:00</u>
Cable 2 # :		Staff :	<u>T. Tidwell</u>
Detector 1 # :	<u>785</u>	Location :	<u>LAB 4</u>
Detector 2 # :		Photo ID:	<u>CEPV-01</u>
Limiter # :			
	Temp. (deg. C) :		
	<u>24</u>		
	Humidity (%) :		
	<u>18</u>		
	EUT Voltage :		
	<u>115</u>		
	EUT Frequency :		
	<u>60</u>		
	Peak Bandwidth:		
	<u>10kHz</u>		
	QP Bandwidth		
	<u>10kHz</u>		
	Avg. Bandwidth		
	<u>10kHz</u>		

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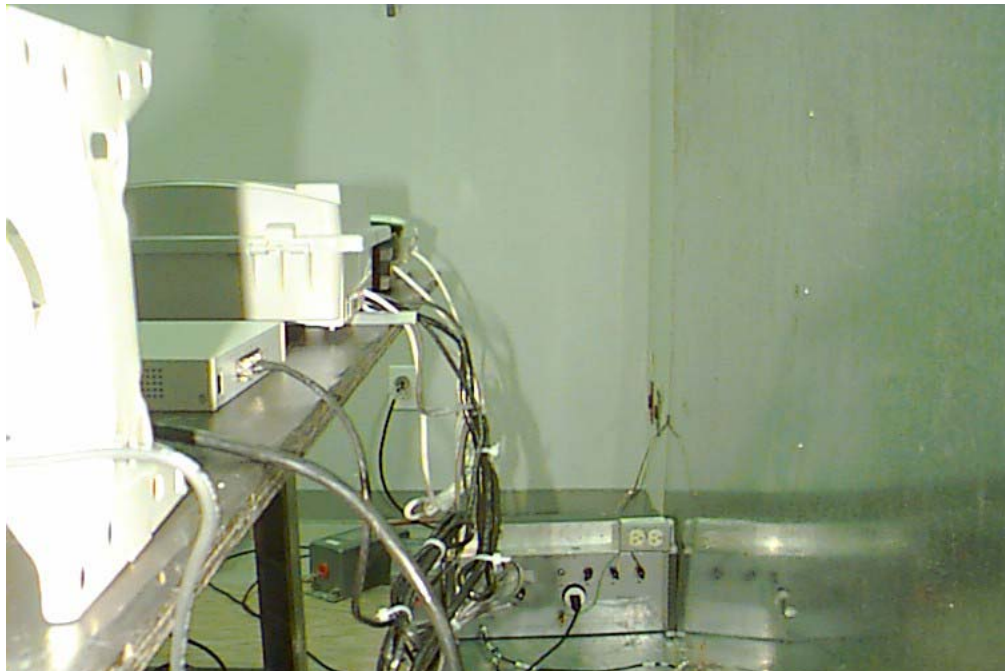
EQUIPMENT: SkyFire™ Subscriber S-IAD

Photos – Powerline Conducted Emissions

Front



Side



EQUIPMENT: SkyFire™ Subscriber S-IAD**Section 10 Test Equipment List**

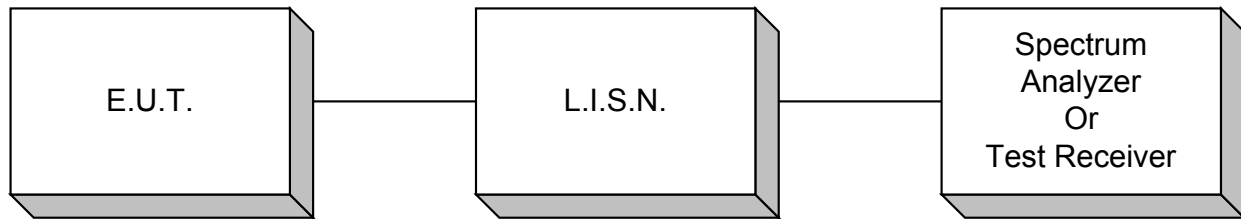
Nemko ID	Description	Manufacturer Model Number	Serial Number	Calibration Date
406	POWER METER	HP 436A	2512A22082	04/03/02
1056	POWER SENSOR (2 - 26.5 GHz)	HEWLETT PACKARD 8485A (50ohm,1.0uW-100mW)	2347A02782	09/27/01
1019	CABLE, 9.5m	KTL RG223	N/A	08/06/01
785	ANALYZER, SPECTRUM	HP 8591E	3412A02996	04/03/02
984	HORN ANTENNA	MILLITECH NONE	NONE	CNR
1651	WR62 Band Pass Filter	Nemko (David Light) None	None	CBU
992	Horn antenna	EMCO 3160-09	9705-1079	CNR
499	Antenna-Biconica	ICC BCON-30300	210	03/31/01
1034	ANTENNA,LP	A.H. SYSTEMS SAS-200/510	121	02/01/01
1514	CABLE ASSY, LAB 2- B OATS	KTL SITE B OATS	N/A	01/21/02
1554	Amplifier, RF	RF Consultants LNA-25	0	11/09/01
1605	LIMITER	FISCHER FCC-45013-1.2	184	01/17/02
1036	SPECTRUM ANALYZER	ROHDE & SCHWARZ FSEK30	830844/006	12/18/01
1478	20db Attenuator DC 18 Ghz	MCL Inc. BW-S20W6	NONE	CBU
1483	Cable 4m	Storm PR90-010-144	N/A	06/04/01
545	LISN	Schwarz Beck 8120	8120350	07/09/01
758	HIGH PASS FILTER	SOLAR 7930-5.0	197	07/18/01
1328	CABLE, .5m	KTL RG223	N/A	03/05/02
1505	Test Receiver	Polorad ESH-2	872095/002	04/09/02
1605	LIMITER	FISCHER FCC-45013-1.2	184	01/17/02
1304	HORN ANTENNA	ELECTRO METRICS RGA-60	6151	07/30/01
1016	Pre-Amp	HEWLETT PACKARD 8449A	2749A00159	05/30/01
1651	WR62 Band Pass Filter	Nemko (David Light) None	None	CBU
1484	Cable 2.0-18.0 Ghz	Storm PR90-010-072	N/A	06/01/01
1485	Cable 2.0-18.0 Ghz	Storm PR90-010-216	N/A	06/01/01
1046	Flex cable 1m	Astrolab Inc. 32022-2-29094K-1M	N/A	01/18/02
1650	WR90 Band Pass Filter	Nemko (David Light) None	None	CBU
983	PRE-AMP, 18-40 GHz	KTL BB1	1	01/18/02
991	Horn antenna	EMCO 3160-10	9704-1049	CNR
988	HARMONIC MIXER	Hewlett Packard 11970A	2332A01929	01/00/00
989	HARMONIC MIXER	Hewlett Packard 11970U	2332A00116	01/00/00

ANNEX A

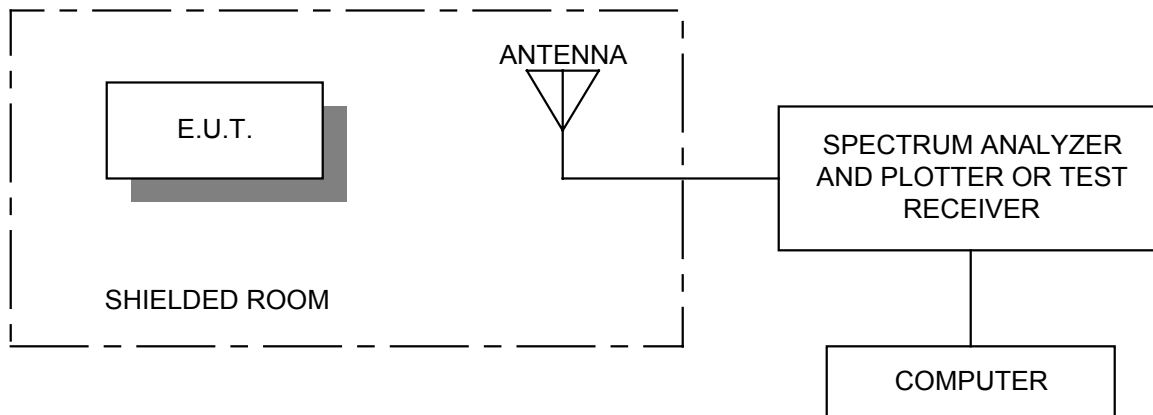
TEST DIAGRAMS

EQUIPMENT: SkyFire™ Subscriber S-IAD

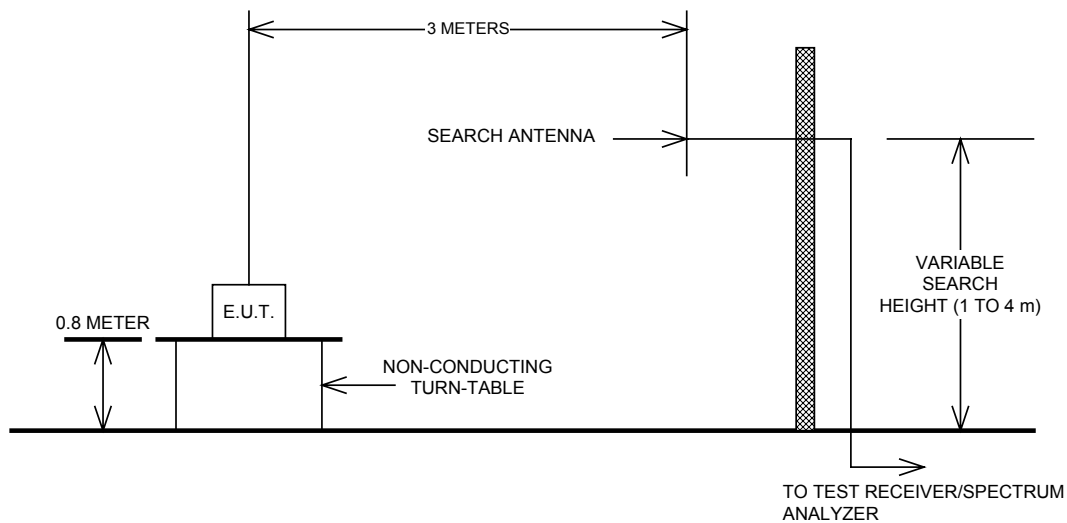
Conducted Emissions



Radiated Prescan



Test Site For Radiated Emissions



EQUIPMENT: SkyFire™ Subscriber S-IAD

RF Conducted Measurements

